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ABSTRACT

This toy modification note presents illustrated instructions on how to build a battery interrupter that permits on/off control of battery-operated toys without modification of the toys themselves. The device allows for a separate control switch which can be custom designed to fit a handicapped user's needs. Information on the construction and use of three types of battery interrupters is provided: Type 1 for regular cylindrical batteries (AA, C, and D cells), Type 2 for 9-volt batteries, and Type 3 for use with cassette tape recorders and other devices having a "remote" jack. Also included in the volume are a description of the electrical principles involved in the interrupter's operation, skill development activities for learning to use a switch, and sources of information on adapted toys and toy modifications. (JDD)

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TOY MODIFICATION NOTE

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Revised 1986

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EC 201276

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TOY MODIFICATION NOTE

BUILD IT YOURSELF BATTERY INTERRUPTER

Permits on/off control of battery operated toys
without modification of the toys themselves

Gregg C. Vanderheiden
Trace R&D Center
University of Wisconsin-Madison

Description

The Trace Battery Interrupter is a simple device which fits between the batteries in a toy and provides the ability to have a separate control (on-off) switch which can be custom designed to fit a handicapped user's needs.

The interrupter can be inserted and removed at any time, by anybody, in a matter of seconds. No modifications to the toy itself are needed. When the interrupter is removed from the toy, the toy will be exactly as it was before the interrupter was inserted.

This Application Note provides information on the construction and use of three types of battery interrupters:

Type 1 - For regular cylindrical batteries (AA, C, and D cells)

Type 2 - for 9 volt transistor radio type batteries (with snaps)

Type 3 - for use with cassette tape recorders and other devices having a "Remote" jack

Also provided is a brief note on how battery interruptors work.

NOTE: A 28-page booklet, Guidelines for Adapting Battery Operated Toys for the Handicapped, is available from

The California Avenue School
Jayne Higgins
215 W. California Avenue
Vista, CA 92083 USA

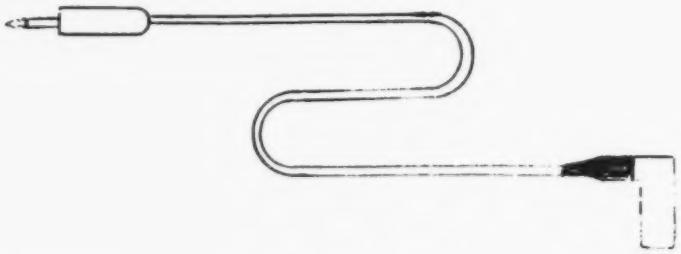
Cost: $3.00 U.S.
$4.00 (U.S. currency) Canada, Mexico, and overseas

This booklet covers procedures and materials for making a pillow switch, touch panel switch, and an on-off switch.

How to Use the Type 1 Interruptor

(for toys that use regular AA, C, and Dbatteries)

The Type 1 battery interruptor (for cylindrical batteries - AA, C, and D cells) looks like this:



plug to connect to switch for handicapped user

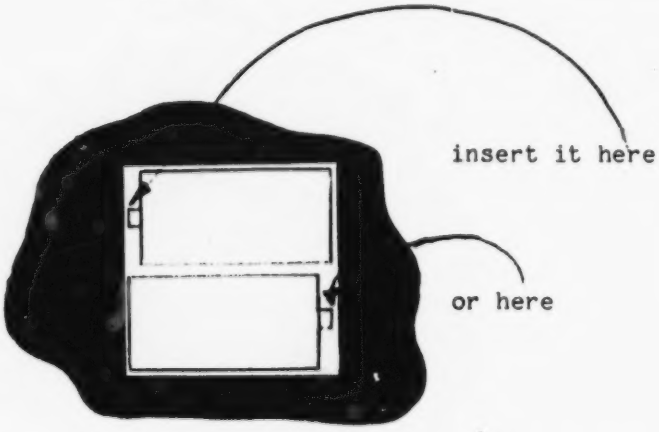
wire

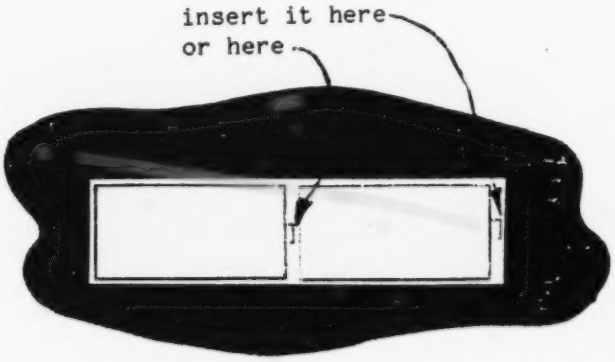
actual interruptor

To use the interruptor, simply:

1) Insert it between any two batteries or between the first battery and the metal tab in the battery compartment of the toy.

2) Close the battery compartment door to help keep it in place.

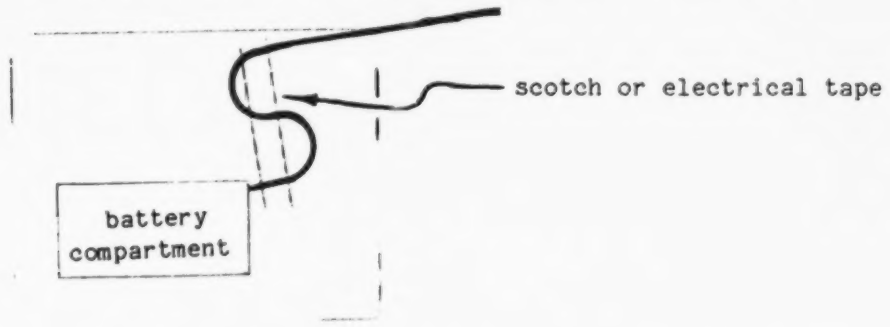




3) If the toy has an on/off switch, put it in the "ON" position.

4) Plug the other end of the interruptor cable into a switch (such as a Zygo Tread Switch) and try it.

Once the Interrupter is in place, avoid pulling on the wire as you may pull it out of position. Some people tape the wire to the back or bottom of the toy to provide a strain relief in case the cord is pulled by accident.



If the interruptor slips out, the toy will just operate as it normally did. Just open the battery door and put the interruptor back in place.

You may pull the interruptor out at any time, and the toy will be exactly as it was before you inserted the Interruptor.

NOTES

- You may have to make a small notch on some toys (on the battery compartment door) for the wire to be able to come out of the battery compartment.

- With the interrupter in place, the toy will not operate unless both the regular on/off switch and the new custom switch are closed or ON.

- If the switch you use is a momentary switch (i.e., it only stays closed while you have your hand on it, like the Zygo switches) the toy will run only while you are holding the switch closed, and will stop when you release the switch.

- If you want the toy to turn on when you hit the switch once and turn off when you hit it again, you must either

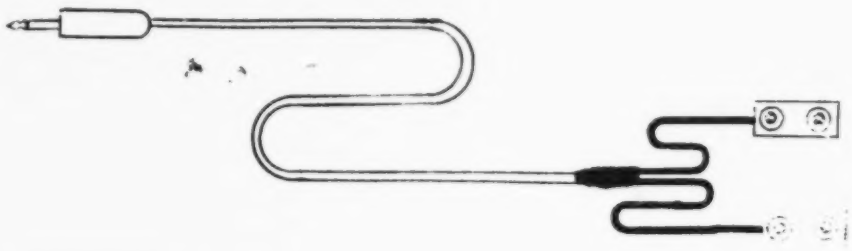
1) get a bistable switch (e.g., a toggle switch or a push on - push off switch)

or 2) get a Trace Multibox (or equivalent), which can make any momentary swtich (including Zygo's) act like a hit on/hit off switch. (The Trace Multibox is available from Prentke Romich.) In addition to allowing on/off control, the Trace Multibox also allows timed control; e.g., the toy runs for a preset time of 2 seconds to 2 minutes each time the switch is hit). The Multibox also provides switch filtering for users who hit the switch multiple times when trying to hit it once.

How to Use the Type 2 Interruptor

(for 9 volt "transistor" batteries)

The Type 2 interruptor is designed for use with transistor radios and other devices which use a 9 volt battery with snaps. The type 2 interruptor looks like:



To use the interruptor,

1) Open the device and take the 9 volt battery out.

2) Put one pair of snaps of the interruptor on te battery, and one pair on the snaps in the device. (It doesn't matter which snaps on the interrupter cable are used for what.)

3) Close the battery door on the toy/radio/etc. with the battery left outside. (It is okay to leave the battery inside the device if it will fit, but it almost never will.)

4) Turn the device on.

5) Connect the interruptor cable to a switch and try it.

NOTES

- You may have to make a small notch on some toys (on the battery compartment door) for the wire to be able to come out of the battery compartment.

- With the interrupter in place, the toy will not operate unless both the regular on/off switch and the new custom switch are closed or ON.

- If the switch you use is a momentary switch (i.e., it only stays closed while you have your hand on it, like the Zygo switches) the toy will run only while you are holding the switch closed, and will stop when you release the switch.

- If you want the toy to turn on when you hit the switch once and turn off when you hit it again, you must either

1) get a bistable switch (e.g., a toggle switch or a push on -

push off switch)

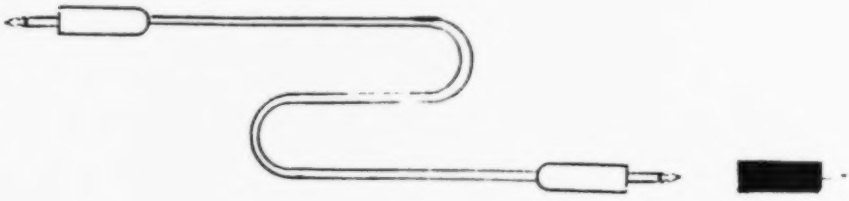
or 2) get a Trace Multibox (or equivalent), which can make any momentary swtich (including Zygo's) act like a hit on/hit off switch. (The Trace Multibox is available from Prentke Romich.) In addition to allowing on/off control, the Trace Multibox also allows timed control; e.g., the toy runs for a preset time of 2 seconds to 2 minutes each time the switch is hit). The Multibox also provides switch filtering for users who hit the switch multiple times when trying to hit it once.

How to Use the Type 3 Interruptor

(for tape recorders or other devices
which have a "Remote" jack)

Some devices, such as cassette tape recorders, have a "Remote" jack on their side. For these devices, a very simple interrupter can be used.

The interruptor is made of two parts which can be secured from any Radio Shack store.



Standard audio cable with
1/8" miniature phone jacks on
each end

1/8" miniature phone plug
to subminiature phone plug
adaptor

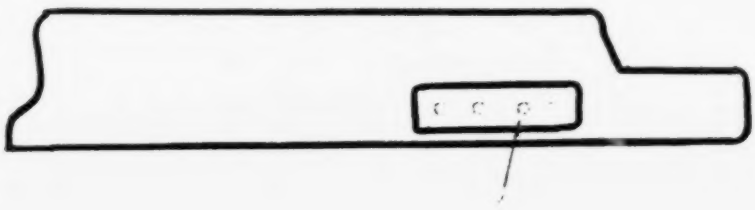
To use the Type 3 interruptor, simply

1) Plug the cable into the adaptor.

2) Plug the adaptor into the "Remote" jack on the recorder.

3) Turn the recorder on.

4) Plug the other end of the interrupter cable to a switch and try it.



"Remote" jack on the recorder

How to Make a Type 1 Interface

Materials Needed

- 1" x 1/2" piece of double-sided 1/32" thick printed circuit board
- 1/8" miniature phone plug*
- 3 to 6 feet of speaker wire*
- 1" shrink wrap tubing (not essential)

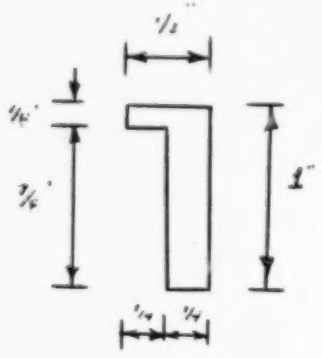
* (You may want to use earphone wire and plug - see notes below).

Tools Needed

- Hacksaw or coping saw
- Soldering iron
- Solder (rosin core)
- Electrical tape

Step 1 - Cut the double-sided printed circuit board to the following dimensions:

Sufficient PC board to make 4 interruptors is attached to this report if ordered from the Trace Reprint Service.



Step 2 - Coat both sides with solder by heating them up and rubbing them with the soldering iron tip while applying solder. Use solder sparingly.

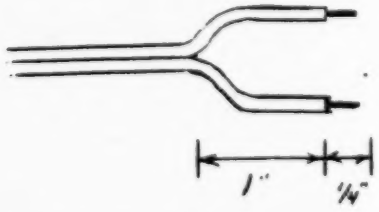
Step 3 - Prepare one end of the speaker wire cable by:

a) splitting the wires back 1"

b) stripping 1/4"

c) "tinning" the wires by heating them and applying a bit of solder to "wet" them.

d) letting them cool.

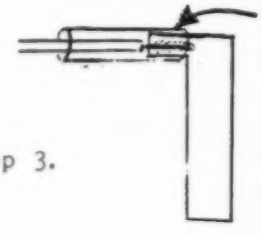


Step 4 - Slip a piece of shrink wrap over the wires if you have some. (Do not shrink it yet!)

Step 5 - Now solder one wire to each side of the interruptor you made in step 1.

Step 6 - After the interruptor has cooled, push the heat shrink over the small blade, as shown below, and heat the shrink wrap carefully. It will shrink down and strengthen the joint.

If you do not have shrink wrap, put a couple turns of electrical tape on to accomplish the same function.



Step 7 - Prepare the other end of the "speaker wire" cable - see Step 3.

Step 8 - Solder the miniature phone connector on by:

a) inserting the wires through the phone plug cap as shown.

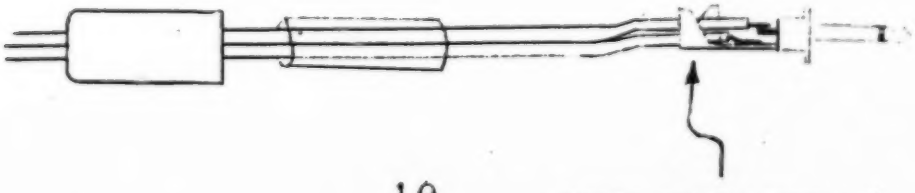
b) slipping a piece of shrink wrap over the wire (if you have some)

c) soldering the wire ends as shown.

d) slipping the shrink wrap over the joints and shrink it (or tape them)

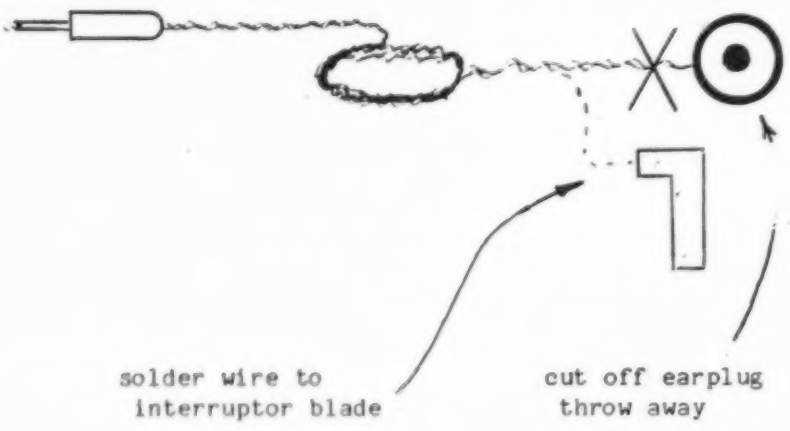
e) clamping the strain relief ears of the phone plug around the wires

f) screw the cap on.



NOTE:

It is often easier and only slightly more expensive (if at all) to buy a cheap earphone with a 1/8" miniature connector on it, and then cut the earphone off and throw it away. You then have your cable with the 1/8" plug already attached. You need only solder it to your interrupter blade and you are done. Earphone cables are also more flexible than speaker wire, and are nicer for that reason. (Be sure that the earphone has a 1/8" phone plug and not the subminiature plug - most have the 1/8" plug.)



How to Make a Type 2 Interruptor

(for 9V battery Devices)

Materials

- two 9v battery clips
- 4-6 ft of "speaker wire"*
- 1/8" miniature phone plug*

*You may want to use a cheap earphone instead - see note at end.

Tools

- soldering iron
- wire stripper
- solder (rosin core only)
- electrical tape (or shrink wrap tubing

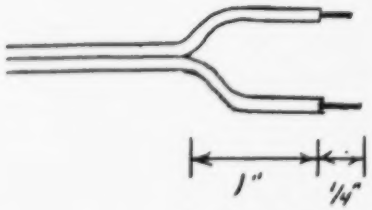
Step 1 - Prepare one end of the speaker wire cable by:

a) splitting the wires back 1"

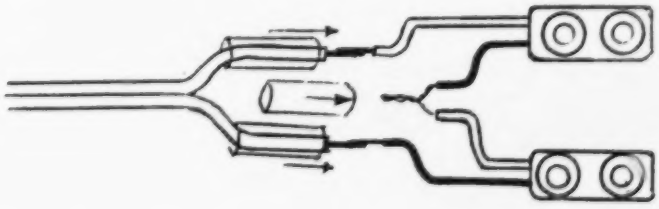
b) stripping 1/4"

c) "tinning" the wires by heating them and applying a bit of solder to "wet" them.

d) letting them cool.



Step 2 - Make connections as shown below, twisting the wires together and soldering. (If you use shrink wrap, be sure to put it over the wires before you make the solder joints - you won't be able to afterwards.)



Step 3 - Wrap all connections with electrical tape or shrink wrap tubing.

Step 4 - Wrap all connections together to make a neat package.

Step 5 - Prepare the other end of the "speaker wire" cable - see Step 1.

Step 6 - Solder the miniature phone connector on by:

a) inserting the wires through the phone plug cap as shown.

b) slipping a piece of shrink wrap over the wire (if you have some)

c) soldering the wire ends as shown.

d) slipping the shrink wrap over the joints and shrink it (or tape them)

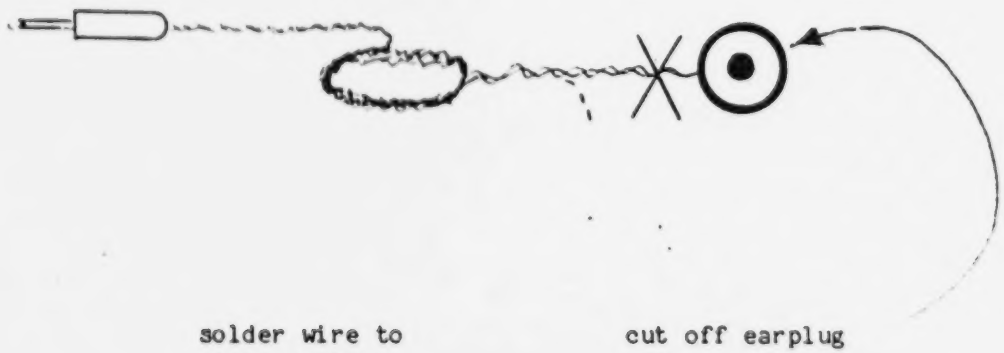
e) clamping the strain relief ears of the phone plug around the wires

f) screw the cap on.

strain relief ears

NOTE:

It is often easier and only slightly more expensive (if at all) to buy a cheap earphone with a 1/8" miniature connector on it, and then cut the earphone off and throw it away. You then have your cable with the 1/8" plug already attached. You need only solder it to your interrupter blade and you are done. Earphone cables are also more flexible than speaker wire, and are nicer for that reason. (Be sure that the earphone has a 1/8" phone plug and not the subminiature plug - most have the 1/8" plug.)



solder wire to interruptor

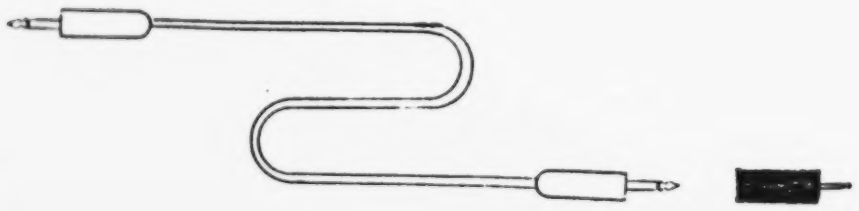
cut off earplug throw away

How to Make a Type 3 Interruptor

(for cassette recorders and other devices with a "Remote" jack)

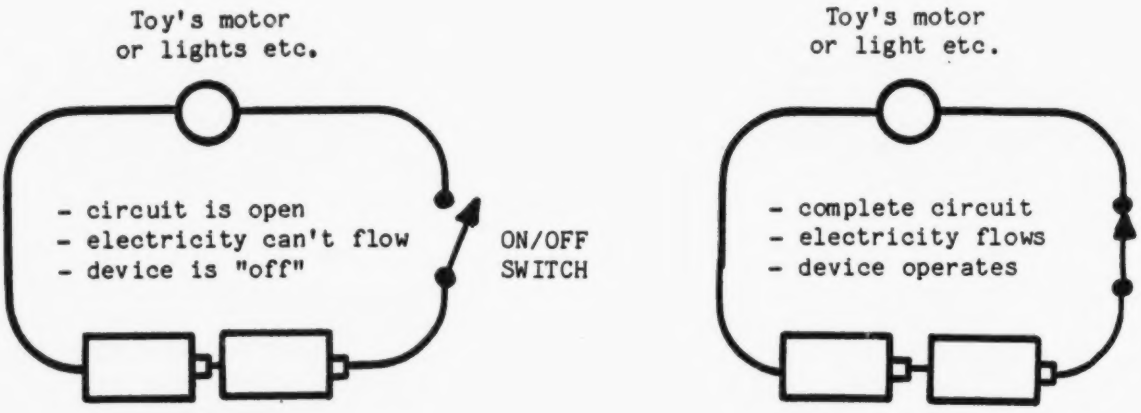
Materials	Tools
o audio cable with 1/8" phone plug on each end (Radio Shack or Zygo) o 1/8" to subminiature phone plug adaptor (Radio Shack).	o none

Step 1 - Plug the two components together.



How They Work

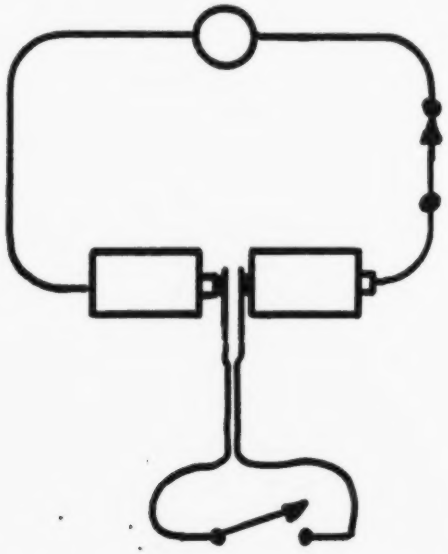
For a toy to work, it needs a complete "circuit" or "path" for the electricity to flow.



NORMAL TOY WITH ITS ON/OFF SWITCH OPEN (off)

NORMAL TOY WITH ITS ON/OFF SWITCH CLOSED (on)

The battery interrupter works by breaking the circuit and allowing you to put a second on/off switch into the circuit.



Now both the normal on/off switch and the user's switch must be closed before there will be a complete circuit and the electricity can flow to make the machine operate.

SWITCH USE : SKILL DEVELOPMENT ACTIVITIES

Learning to use a switch often requires skill development. Skill development activities can often be cone in a game format. Some possible ideas for activities would include:

Use of tape loops to provide voice output during specific activities. For example if the switch user is out of the wheelchair, is watching TV in the wheelchair, is in sidelying, etc. a switch could be positioned so that he/she could activate it. A tape loop inserted in the recorder would have the message "please come over here". During a group activity that is a favorite of children, a tape loop could be used with the message "its my turn". In any application, an appropriate line drawing would be attached to the face of the switch or placed next to the switch within the user's range of vision. By using two tape recorders, each with the appropriate picture symbol attached, voice output can be provided for choice making activities. For example, the symbol of TV could be accompanied by a tape loop saying "I want to watch TV" and a line drawing of a record player, radio, etc. could have the message "I want music". The possible applications utilizing the switch in this way are endless. In certain teaching situations a cassette could be used rather than continually investing or making tape loops. The tape loops are handy for times when the switch user is left more independently so that there is not a concern about rewinding and being at the appropriate point. One final note regarding the use of tape recording is that the recorded voice should be done by someone of approximately the switch user's age.

Other positive experiences utilizing the switch will be cause and effect activities in which the switch will control objects in the environment. It has been found that battery operated toys quickly lose their appeal and are not that reinforcing to children. The ability to control things such as a fan in hot weather, music, or a light tend to be more positive experiences. The most positive use of a switch, however, is in causing something to happen that will elicit attention and reaction from adults and/or other children. We tend to overlook this too often - the fact that for a child who is severely physically involved there are very few ways of eliciting this kind of reaction and attention independently. These kinds of play situations can be set up, for example, if a battery operated car is activated and knocks over blocks. The reaction of the play partner will be the reinforcing consequence as much or more than the blocks being knocked over or the car going. In the same way, if use of a computer is introduced, it will be the reaction of others who are there for training and support as the individual operates the computer rather than something inherent in a program which is being run. The following type of equipment has proven to be useful in providing functional switch control experiences.

Skill Development Activities

Contact vendors or Trace Center for further information. Prices do not include shipping, etc.

1. On-off-module - Changes switch on/off function from momentary to latching. This will allow control of items without having to maintain switch closure. Sources include:

Steven Kanor, Ph.D., Inc.
8 Main Street
Hastings-on Hudson, NY 10706
(917) 478-0960

Push-On-Push-Off Module
$42.00

TASH, Inc.
70 Gibson Drive, Unit 1
Markham, Ontario L3R 3Z4
(916) 475-2212

Switch Latch, #4388
$99.00

2. Timer module - allows a switch activation to turn something on for a predetermined amount of time, and requires another switch closure to reactivate following that length of time. Sources include:

Steven Kanor
(address above)

Time Module
$42.00

Arroyo and Associates
88-45 79th Avenue
Glendale, NY 11385
(718) 849-9306

Delay Timer DT-1
$150.00

3. Environmental control modules - allow you to plug in electrical appliances into the module which is plugged into the wall, thereby allowing control of electrical appliances utilizing the switch. Sources include:

Steven Kanor
(address above)

Environmental Control
$65.00

Arroyo
(address above)

Mini-Environmental Control
MECU - 1
$160.00

4. Combined Time and On-Off Devices - There are three devices which combine these functions.

Prentke Romich Company
1022 Heyl Road
Wooster, OH 44691
(216) 262-1984

Training Aid 2
$380.00

This is the new improved version of the Trace Multibox. Features latching on/off or preset time of activation for both battery-operated and electrical appliances. Two separate channels allow control of 2 devices.

TASH
(Address above)

Dual Switch Latch and Timer, $4389
$180.00

This allows latching on/off activation,
- use of momentary activation which turns off after a preset time,
- a switch delay to vary the length of time the switch must be held closed before activation. Two channels allow separate control of 2 devices (battery operated).

ABLENET
360 Hoover Street, N.E.
Minneapolis, MN 55413
(612) 331-5958

Ablenet Control System
$105.00 ($80.00 control unit, $25.00 switch)

The control unit permits control of any 2 toys or electrical appliances - directly or with a 2-90 second timer.

5. Battery interrupter cables - allow switch control of any battery run appliance or toy without having to modify with a jack. In addition to this reprint, other resources and sources include:

How-to -

- Burkhardt, Linda J. (1980) More Homemade Battery Powered Toys and Educational Devices (see address on Trace Center Adaptive Toys Quick Sheet)

- Higgins, Jayne (1982) Guidelines for Adaptive Toys (see address on Trace Center Adaptive Toys Quick Sheet)

Commercial Sources -

- Don Johnston Developmental Equipment 900 Winnetka Terrace Lake Zurick, IL 60047 (917) 438-3476	Battery Adapter, #720
- Prentke-Romich (address above)	Battery Interface, #B1-1 $28.00
- TASH (address above)	Toy Cable, #4378 (AA,C) #4379(D) $8.80
- ABLENET (address above)	Battery Device Adapter $4.50 (has thin, flexible copper ends to facilitate use)

Tape loops such as those described above can be made or can be purchased at stores such as Radio Shack. A Trace Quick Sheet regarding adaptive toys and toy modification is included with this information.

Trace Center

Trace Research and Development Center
on Communication, Control & Computer Access for Handicapped Individuals
Waisman Center
University of Wisconsin-Madison

1500 Highland Avenue • Madison, Wisconsin 53705-2280 • (608) 262-6966 TDD: (608) 263-5408

Trace Quick Sheets
September, 1986

Adaptive Toys and Toy Modifications

The following pages contain information regarding adapted toys and toy modifications to allow single switch control. No recommendations or endorsements are implied by inclusion on this list. Contact each resource for more specific and up-to-date information.

Books and Pamphlets

Switching Mechanisms for Special Needs – A Project Manual
William M. Lynn
$6.50
National Clearinghouse of Rehabilitation Materials
115 Old USDA Building
Oklahoma State University
Stillwater, OK 74078
405/624-7650
This project manual first explains how switches work by presenting basic electronics principles, and then provides step-by-step instructions for building several types of switches and accessories.

Play: Children's Business, A Guide to Play Materials
1974
Association for Childhood Education International
Washington, D.C: Association for Childhood Education

Toys and Games for Educationally Handicapped Children
1969
Buist, Charlotte & Schulman, Jayne
Springfield, IL: Thomas Publishing

Homemade Battery Powered Toys and Educational Devices for Severely Handicapped Children
1980
Linda J. Burkhardt
8503 Rhode Island Avenue
College Park, MD 20740

More Homemade Battery Devices for Severely Handicapped Children with Suggested Activities
1982
Linda J. Burkhardt
8503 Rhode Island Avenue
College Park, MD 20740

Homemade Switches and Toy Adaptations for Early Training with Nonspeaking Persons
1984
William B. Coker, Jr.
Cincinnati Center for Developmental Disabilities
3300 Elland Avenue
Cincinnati, OH 45229
LSIISS 15, 1, pp.32-35. (Reprints)

Technology for Independent Living Sourcebook
Alexandra Enders (ed.)
1984
RESNA
1101 Connecticut Avenue
Suite 700
Washington, DC 20036
202/857-1199
This book contains a comprehensive listing of associations, toy libraries in each state, and manufacturers and distributors of special toys.

Guidelines for Adapting Toys for the Physically Handicapped
Jayne Higgins
1982
California Avenue School
215 West California Avenue
Vista, CA

Touch Toys and How to Make Them
1984
$3.00 + .60 for postage
Touch Toys
P.O. Box 2224
Rockville, MD 20852
This is an instruction book on how to make over 100 toys for the blind. Checks payable to: Touch Toy.

Toy Modification Note: Build-it-Yourself-Battery-Insert
O.C. Vanderheiden
1982
Trace Center
1500 Highland Avenue
S-151 Waisman Center
Madison, WI 53705
608/262-6966

Strategies for Helping Severely and Multiply Handicapped Citizens
Whethered, J. Greer, R. Anderson, and S. Odle (eds.)
1982
University Park Press
Baltimore, MD

From Toys to Computers: Access for the Physically Disabled Child
C. Wright and M. Nomura
1985
$17.00 (4th class), $20.00 (1st class) Plus $1.11 outside U.S.
Christine Wright
P.O. Box 700242
San Jose, CA 95170

Catalogs

Compu-Robot
$34.95
Comp Tech Systems Design
P.O. Box 516
Hastings, MN 55033
An audio-controlled robot. Easy-to-use, programmable, remembers up to 48 commands, 3 speed, right and left turn, u-turn, pause. Uses 4 AA-batteries.

Arroyo & Associates
88-45 79th Avenue
Glendale, NY 11385
718/849-9306

Automated Therapy Systems
Harding and Harris
P.O. Box 1599
Orem, UT 84057

Behavioraids
Social Technology Product
1210 Alameda Drive
Tempe, AZ 85282

"Special Populations Catalogue"
Flaghouse, Inc.
18 W. 18th Street
New York, NY 10011
212/989-9700

Kaye's Kids
1010 E. Pettigrew Street
Durham, NC 27701-4299
919/683-1051

"Active Simulation Program"
Dr. Edmond Zuromski
Handicapped Children's Technological Services. Inc.
P.O. Box 7
Foster, RI 02825
401/397-7666
"Active Simulation Program" offer a series of technical newsletters and an equipment development manual; markets his products commercially.

A Declaration of Independence
Adaptive Aids
P.O. Box 13178
Tucson, AZ 85732

Toys for Special Children
Steven Kanor, Ph.D
101 Lefurgy Avenue
Hastings on Hudson, NY 10706

Zygo Industries, Inc.
P.O. Box 1008
Portland, OR 97297-1008
503/297-1725

Handicapped Children's Technological Services, Inc.
P.O. Box 7
Foster, RI 02825

The Able Child
325 Will Street
New York, NY 10014

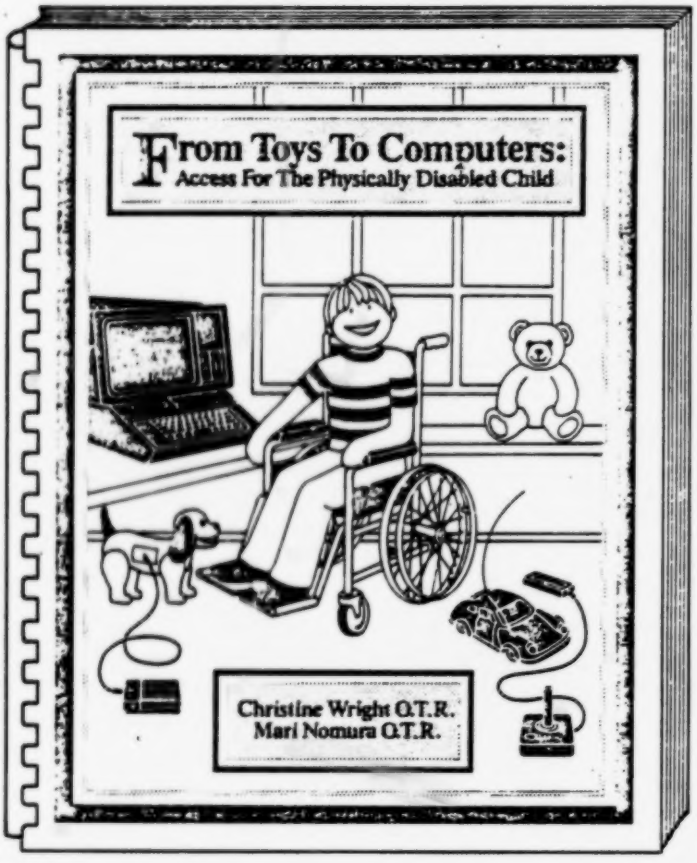
Associations and Organizations

LEKOTEK
613 Dempster
Evanston, IL 60201
312/328-0001
A non-profit resource center with specialized play materials, therapy equipment, and books for loan.

ACTIVE
Play Matter/NTLA
Seabrook House
Darkes Lane
Potters Bar, Herts, ENGLAND EN6 2HL

USA Toy Library Association (USA-TLA)
Judith Iacuzzi, Exec. Director
1800 Pickwick Avenue
Glenview, IL 60025
312/724-7700
Toy library, information on adaptive toys, newsletter.

NEW BOOK



New opportunities for learning.

Until recently, it was frustrating, if not impossible, for many physically disabled children to interact with toys and the microcomputer, both tools for learning. Now, however, there are many adaptations and devices which make it possible for even the most severely physically disabled child to interact with these important tools. Determining how this can be done requires special skills and a broad base of knowledge. That is what "From Toys to Computers..." is all about.

Written by occupational therapists, it's the first illustrated guidebook to the adaptations, devices and techniques a physically disabled child can use to access toys and computers.

The complete "how-to" guidebook.

- How to select appropriate toys.
- How to adapt battery operated toys.
- How to make switches, where to find them.
- How to determine switch control.
- How to establish a toy lending library.
- Photos of commercially available toys selected for ease of manipulation and adaptability.
- Proper positioning for enhancing motor control.
- An introduction to the microcomputer.
- Illustrated options for accessing the computer.
- Evaluating for computer access.
- Ideas for establishing a microcomputer center for physically disabled children.
- References, resources, and more.

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YES! Please send me a copy of your new book.

Please send me _____ copies of *From Toys to Computers: Access for the Physically Disabled Child*, @ just $17.00 per copy (includes Fourth Class postage and handling). For First Class or outside the U.S. mainland add $3.00. California residents add 6½% sales tax ($1.11).

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Christine Wright
P.O. Box 700242
San Jose, CA 95170

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Allow 4-6 weeks for delivery.